

**REMARKS<sup>1</sup>**

In the outstanding Office Action, the Examiner made the following rejections:

- 1) Claim 1 under 35 U.S.C. § 112, second paragraph;
- 2) Claims 8-14 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,222,195 to Yamada et al. (*Yamada*) in view of U.S. Patent No. 6,016,187 to Noguchi et al. (*Noguchi*);
- 3) Claims 15-18, and 20 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,172,365 to Hiroi (*Hiroi*) in view of U.S. Patent No. 6,317,198 to Sato et al. (*Sato '198*);
- 4) Claim 19 under 35 U.S.C. § 103(a) as being unpatentable over *Hiroi* and *Sato '198*, and further in view of U.S. Patent No. 7,221,788 to Schulze et al. (*Schulze*);
- 5) Claim 1 under 35 U.S.C. § 103(a) as being obvious over U.S. Patent Application Publication No. 2001/0019407 to Sato et al. (*Sato '407*);
- 6) Claims 2-4, 6, and 7 under 35 U.S.C. § 103(a) as being unpatentable over *Sato '407* in view of *Sato '198*, and further in view of *Hiroi*; and
- 7) Claim 5 under 35 U.S.C. § 103(a) as being unpatentable over *Sato '407* and *Sato '198* and further in view of *Schulze*.

By this amendment, Applicant has amended claims 1, 8, and 15. Claims 1-20 remain pending in this application.

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<sup>1</sup> The Office Action contains statements reflecting characterizations of the related art and the claims. Regardless of whether any such statement is identified herein, Applicant declines to automatically subscribe to any statement or characterization in the Office Action.

**I. Claim Rejections under 35 U.S.C. § 112**

In the Office Action, the Examiner applies form paragraph 7.34.07 to assert that the claims are indefinite under 35 U.S.C. § 112, second paragraph, without providing any examples or specific instances of indefiniteness. See Office Action, page 2. Should the Examiner maintain that the claims are “replete with grammatical and idiomatic errors,” Applicant requests that the Examiner provide specific examples of such errors.

The Examiner has also rejected claim 1 under 35 U.S.C. § 112, second paragraph, for alleged indefiniteness. Although Applicant disagrees with the Examiner’s allegation, Applicant has amended claim 1 to address the Examiner’s concerns and in an attempt to expedite prosecution. Accordingly, Applicant requests that the Examiner withdraw the rejection of claim 1 under 35 U.S.C. § 112, second paragraph.

**II. Claim Rejections Under 35 U.S.C. § 103(a)**

Applicant respectfully traverses the rejection of claims 1-20 under 35 U.S.C. § 103(a). No *prima facie* case of obviousness is established.

The key to supporting any rejection under 35 U.S.C. § 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. Such an analysis should be made explicit and cannot be premised upon mere conclusory statements. MPEP § 2142, 8th Ed., Rev. 6 (Sept. 2007). “A conclusion of obviousness requires that the reference(s) relied upon be enabling in that it put the public in possession of the claimed invention.” MPEP § 2145. Furthermore, “[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the

art” at the time the invention was made. MPEP § 2143.01(III), internal citation omitted. Moreover, “[i]n determining the differences between the prior art and the claims, the question under 35 U.S.C. § 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious.” MPEP § 2141.02(I), internal citations omitted (emphasis in original).

“[T]he framework for the objective analysis for determining obviousness under 35 U.S.C. § 103 is stated in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). . . . The factual inquiries . . . [include determining the scope and content of the prior art and] . . . [a]scertaining the differences between the claimed invention and the prior art.” MPEP § 2141(II). “Office personnel must explain why the difference(s) between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art.” MPEP § 2141(III). In this application, a *prima facie* case of obviousness has not been established because the Office Action has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the claimed invention and the prior art. Accordingly, the Office Action has failed to clearly articulate a reason why the prior art would have rendered the claimed invention obvious to one of ordinary skill in the art.

A. Claims 8-14

Claim 8 recites a processor for inspecting an illumination optical system including “a plurality of inspection patterns of a resist film having a plurality of openings, the inspection patterns obtained by projecting exposure beams output from a plurality of effective light sources onto the resist film coated on a surface of an exposure target substrate by a plurality of imaging components,” wherein “each opening corresponds to

one of the effective light sources, and each inspection pattern corresponds to one of the imaging components." *Yamada* fails to disclose or suggest the claimed processor.

*Yamada* discloses the control unit 150 of the electron-beam exposure device 100, including a data-management unit 153 storing exposure data in a buffer memory 154 and sending the sub-deflection data to a sub-deflector-deflection setting unit 155. See *Yamada*, col. 2, lines 5-26, and Fig. 1. *Yamada*, however, provides no disclosure or suggestion of "a plurality of inspection patterns of a resist film having a plurality of openings, the inspection patterns obtained by projecting exposure beams output from a plurality of effective light sources onto the resist film coated on a surface of an exposure target substrate by a plurality of imaging components," wherein "each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components," as recited in claim 8. The Examiner acknowledges this deficiency of *Yamada* at page 4 of the Office Action.

*Noguchi* fails to cure the above-noted deficiencies of *Yamada*. *Noguchi* teaches a projection exposure device 3000 where a mask circuit pattern 104 of a mask 100 illuminated by light from a mercury lamp 3101 is imaged onto a substrate 200. See *Noguchi*, col. 6, lines 52-58, col. 7, lines 55-60, Fig. 4 and Fig. 5. *Noguchi* also discloses an eye 3301 of an imaging lens, an image 3305a of a light source imaged on the eye, and diffraction images 3305b, 3305c of a light source resulting a circuit pattern on a mask 100. See *Id.*, at col. 10, lines 53-60, and Figs. 15(a) and 15(b). *Noguchi* further discloses "light having transmitted through a mask circuit pattern 104 (shown, for example, in FIG. 37) having a high contrast on the wafer (substrate) 200 through an imaging lens (reduction projection lens) 3201 and an imaging spatial filter 3302

mounted in the vicinity of a pupil of the imaging lens" (col. 14, lines 7-13), wherein "[t]he light source spatial filter 3301 forms a light source of a ring portion 3305..." (col. 14, lines 20-21). *Noguchi* thus discloses using a light source spatial filter in the eye of the imaging lens 3301. *Noguchi* thus cannot disclose or suggest a combination including "a plurality of inspection patterns of a resist film having a plurality of openings, the inspection patterns obtained by projecting exposure beams output from a plurality of effective light sources onto the resist film coated on a surface of an exposure target substrate by a plurality of imaging components," wherein "each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components," as recited in claim 8 (emphasis added).

Accordingly, the elements recited in claim 8 are neither taught nor suggested by the applied references. Nor has the Examiner explained how teachings of the references could be modified to achieve the claimed combination. Consequently, the Office Action has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the claimed invention. Accordingly, no reason has been clearly articulated as to why the claim would have been obvious to one of ordinary skill in the art in view of the prior art. Therefore, a *prima facie* case of obviousness has not been established for claim 8.

For at least the reasons above, claim 8 is allowable. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejection of claim 8 under 35 U.S.C. § 103(a).

If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596

(Fed. Cir. 1988). Accordingly, Applicants respectfully request that the Examiner withdraw the rejection of dependent claims 9-14 under 35 U.S.C. § 103(a).

B. Claims 15-18 and 20

Claim 15 recites a combination including "generating a plurality of inspection patterns of the inspection resist film having a plurality of openings, by projecting exposure beams output from a plurality of effective light sources onto the inspection resist film via the imaging components, wherein each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components." *Hiroi* fails to disclose or suggest this feature.

*Hiroi* discloses a pattern on an object, such as a semiconductor wafer, formed by a material A3 and a material B4 (see col. 12, lines 4-9, and Figs. 6A to 6E), and a difference in the image signal detected by the sensor 11 according to whether the scan direction of the electron beam is the X direction or Y direction because of the charge-up ease phenomenon in the pattern (see col. 14, lines 33-39). *Hiroi* further discloses "[i]f the material and the section shape of the pattern of the object ... are changed, the charge-up phenomenon and the charge-up ease phenomenon ... for the pattern located in the upper layer also change." *Hiroi*, col. 16, lines 21-26. *Hiroi*, however, provides no disclosure or suggestion of "generating a plurality of inspection patterns of the inspection resist film having a plurality of openings, by projecting exposure beams output from a plurality of effective light sources onto the inspection resist film via the imaging components, wherein each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components," as recited in claim 15.

Moreover, Applicant notes that the object of *Hiroi* for inspection by using an electron beam is the semiconductor wafer, or a photomask, thin-film multilayer substrate, printed circuit board or TFT substrate (see column 11, lines 36-39). In embodiments consistent with the present invention, on the other hand, the target for inspection may be an illumination optical system of an exposure tool.

*Sato '198* fails to cure the above-noted deficiencies of *Hiroi*. *Sato '198* discloses a method of examining an exposure tool in which a resist pattern is produced such that the pattern of the reticle 2 is put in the position 5 cm closer to the light source than the position of the normal reticle 2 surface conjugate with the wafer 5 in the projection optical system 3, and the wafer 5 coated with photoresist is placed in the position where normal pattern exposure is to be made. See *Sato '198* col. 6, lines 17-26, and Fig. 4. *Sato '198* further discloses "the light 9 arrived at the inside of the pupil 4, or the NA, reaches the wafer 5, whereas the first-order diffracted light 8 arrived outside of the pupil 4 is shaded and fails to reach the wafer." *Sato '198*, col. 7, lines 19-23. *Sato '198*, however, provides no disclosure of "generating a plurality of inspection patterns of the inspection resist film having a plurality of openings, by projecting exposure beams output from a plurality of effective light sources onto the inspection resist film via the imaging components, wherein each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components," as recited in claim 15 (emphasis added).

Accordingly, the elements recited in claim 15 are neither taught nor suggested by the applied references. Nor has the Examiner explained how teachings of the references could be modified to achieve the claimed combination. Consequently, the

Office Action has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the claimed invention. Accordingly, no reason has been clearly articulated as to why the claim would have been obvious to one of ordinary skill in the art in view of the prior art. Therefore, a *prima facie* case of obviousness has not been established for claim 15.

For at least the reasons above, claim 15 is allowable. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejection of claim 15 under 35 U.S.C. § 103(a).

If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596 (Fed. Cir. 1988). Accordingly, Applicants respectfully request that the Examiner withdraw the rejection of dependent claims 16-18 and 20 under 35 U.S.C. § 103(a).

C. Claim 19

Claim 19 depends from claim 15 and thus requires all of the elements recited in claim 15. As discussed above, *Hiroi* and *Sato '198* fail to disclose or suggest a combination including "generating a plurality of inspection patterns of the inspection resist film having a plurality of openings, by projecting exposure beams output from a plurality of effective light sources onto the inspection resist film via the imaging components, wherein each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components," as recited in claim 15 and required by claim 19. *Schulze* fails to cure the deficiencies of *Hiroi* and *Sato '198*.



The Examiner cites to *Schulze* for allegedly disclosing "the imaging components are a plurality of lenses in a lens array." Office Action, page 11. Such alleged teachings, even if combinable with *Hiroi* and *Sato '198* fail to cure the above-noted deficiencies of *Hiroi* and *Sato '198*. That is, *Schulze* also fails to disclose a combination including "generating a plurality of inspection patterns of the inspection resist film having a plurality of openings, by projecting exposure beams output from a plurality of effective light sources onto the inspection resist film via the imaging components, wherein each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components," as recited in claim 15, and required by claim 19. Nor has the Examiner explained how teachings of the references could be modified to achieve the claimed combination.

A *prima facie* case of obviousness has thus not been established for claim 19. Claim 19 is therefore allowable. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejection of claim 19 under 35 U.S.C. § 103(a).

D. Claim 1

Claim 1 recites a combination including "generating a plurality of inspection patterns of the resist film having a plurality of openings, by projecting exposure beams output from a plurality of effective light sources onto the resist film via the imaging components, wherein each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components." *Sato '407* fails to disclose or suggest at least this feature.

*Sato '407* discloses an inspection method of an exposure apparatus including rendering the wafer 5 and the photomask 3 non-conjugate with respect to the projection

optical system (see paragraph [0060], and Fig. 2), determining a shape of a diffraction light pattern as a reference, selecting patterns each of which is most similar to this reference pattern from the five kinds of photoresist patterns (see paragraph [0067], Figs. 4 and 5), and measuring a change of the light transmittance depending on the path of the projection optical system in a state in which the photomask and the wafer are not conjugate with respect to the projection optical system (see paragraph [0070]). *Sato '407* also discloses using a photomask 131 having a pinhole pattern 132 for forming photoresist patterns as shown in FIG. 15A, wherein photomask 131 acts a grating pattern to generate first-order diffraction light patterns on a wafer 5. See *Sato '407*, paragraphs [0114]-[0118], FIGS. 14, and 15A. *Sato '407*, however, provides no disclosure or suggestion of a combination including "generating a plurality of inspection patterns of the resist film having a plurality of openings, by projecting exposure beams output from a plurality of effective light sources onto the resist film via the imaging components, wherein each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components," as recited in claim 1 (emphasis added).

*Sato '198* fails to cure the deficiencies of *Sato '407*, for at least the reasons presented above. That is, *Sato '198* also fails to disclose a combination including "generating a plurality of inspection patterns of the resist film having a plurality of openings, by projecting exposure beams output from a plurality of effective light sources onto the resist film via the imaging components, wherein each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components," as recited in claim 1.

Accordingly, the elements recited in claim 1 are neither taught nor suggested by the applied references. Nor has the Examiner explained how teachings of the references could be modified to achieve the claimed combination. Consequently, the Office Action has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the claimed invention. Accordingly, no reason has been clearly articulated as to why the claim would have been obvious to one of ordinary skill in the art in view of the prior art. Therefore, a *prima facie* case of obviousness has not been established for claim 1.

For at least the reasons above, claim 1 is allowable. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejection of claim 1 under 35 U.S.C. § 103(a).

E. Claims 2-4, 6, and 7

Claims 2-4, 6, and 7 depend from claim 1 and thus requires all of the elements recited in claim 1. As discussed above, and *Sato '407* fails to disclose or suggest a combination including "generating a plurality of inspection patterns of the resist film having a plurality of openings, by projecting exposure beams output from a plurality of effective light sources onto the resist film via the imaging components, wherein each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components," as recited in claim 1 and required by claims 2-4, 6, and 7. *Sato '198* and *Hiroi* fail to cure the deficiencies of *Sato '407*.

The deficiencies of *Sato '198* and *Hiroi* are discussed above. That is, *Sato '198* and *Hiroi* also fail to disclose a combination including "generating a plurality of inspection patterns of the resist film having a plurality of openings, by projecting

exposure beams output from a plurality of effective light sources onto the resist film via the imaging components, wherein each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components," as recited in claim 1, and required by claims 2-4, 6, and 7. Nor has the Examiner explained how teachings of the references could be modified to achieve the claimed combination.

A *prima facie* case of obviousness has thus not been established for claims 2-4, 6, and 7. Claims 2-4, 6, and 7 are therefore allowable. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejection of claims 2-4, 6, and 7 under 35 U.S.C. § 103(a).

F. Claim 5

Claim 5 depends from claim 1 and thus requires all of the elements recited in claim 1. As discussed above, *Sato '407* fails to disclose or suggest a combination including "generating a plurality of inspection patterns of the resist film having a plurality of openings, by projecting exposure beams output from a plurality of effective light sources onto the resist film via the imaging components, wherein each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components," as recited in claim 1 and required by claim 5. *Schulze* and *Sato '198* fail to cure the deficiencies of *Sato '407*.

The deficiencies of *Sato '198* and *Schulze* are discussed above. That is, *Sato '198* and *Schulze* also fail to disclose a combination including "generating a plurality of inspection patterns of the resist film having a plurality of openings, by projecting exposure beams output from a plurality of effective light sources onto the

resist film via the imaging components, wherein each opening corresponds to one of the effective light sources, and each inspection pattern corresponds to one of the imaging components," as recited in claim 1, and required by claim 5. Nor has the Examiner explained how teachings of the references could be modified to achieve the claimed combination.

A *prima facie* case of obviousness has thus not been established for claim 5. Claim 5 is therefore allowable. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejection of claim 5 under 35 U.S.C. § 103(a).

**III. Conclusion**


In view of the foregoing amendments and remarks, Applicant respectfully requests reconsideration of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,  
GARRETT & DUNNER, L.L.P.

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By:   
Darrell D. Kinder, Jr.  
Reg. No. 57,460  
650.849.6733